APPENDIX VII

DESIGN OF OPEN-HEARTH FURNACES

By A. D. WILLIAMS

IN designing an open-hearth furnace the first point to be settled is the size of the hearth. Molten metal weighs 430 Ib per cubic feet, so that 5.23 cu ft of bath will be required per ton of metal capacity. The depth of bath permissible depends upon the work to be done. With a shallow bath the reactions will be completed faster than in a deep bath. The boil will be more violent and the depth allowed for the molten cinder will be greater. Furnaces of the mixer type, used in the Talbot and duplex process, are much deeper than those used in the regular process.

In the pig and ore process the boil will increase the volume of the bath to from 2 to 2.5 volumes. In the scrap process the bath may boil to 1.5 to 1.7 its original volume.' The manner of handling the cinder, whether it is retained in the furnace until the heat is tapped or is to be drawn off by a cinder skimming notch, affects the depth. In the early furnaces room had to be provided for all of the cinder, and overflows were not infrequent. One advantage of the Campbell tilting furnace was the facility it offered for running off a portion of a heavy cinder. Later furnaces were built with a cinder notch which permitted draining any excess amount of cinder.

Table 1 gives the approximate hearth area in square feet required for bath depths ranging from 1 to 3 ft. It was computed by the formula:

$$_{n}V \qquad _{4}$$

in which *V—volume of molten metal in charge;*
d = depth of bath, metal only;
yi=area of hearth.